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<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top; padding: 5px;"> <p>(21) International Application Number: PCT/US98/11257</p> <p>(22) International Filing Date: 1 June 1998 (01.06.98)</p> <p>(30) Priority Data: 08/865,815 30 May 1997 (30.05.97) US</p> <p>(71) Applicant (for all designated States except US): ROCKWELL INTERNATIONAL CORPORATION [US/US]; Suite 700, 600 Anton Boulevard, Costa Mesa, CA 92626 (US).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): BERRY, Dickey, J. [US/US]; 5787 Via Barcelona, La Verne, CA 91750 (US). ACKLAND, Mark, A. [US/US]; 1920 Canyon Close Road, Pasadena, CA 91107 (US). CHANG, Angela [US/US]; 2310 Tulsa Avenue, Claremont, CA 91711 (US). KELLY, James, T. [US/US]; 895 Carmen Street, La Verne, CA 91750 (US).</p> <p>(74) Agent: STEPHENS, L., Keith; Rockwell International Corporation, Suite 700, 600 Anton Boulevard, P.O. Box 5090, Costa Mesa, CA 92628-5090 (US).</p> </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> <p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p> </td> </tr> </table>			<p>(21) International Application Number: PCT/US98/11257</p> <p>(22) International Filing Date: 1 June 1998 (01.06.98)</p> <p>(30) Priority Data: 08/865,815 30 May 1997 (30.05.97) US</p> <p>(71) Applicant (for all designated States except US): ROCKWELL INTERNATIONAL CORPORATION [US/US]; Suite 700, 600 Anton Boulevard, Costa Mesa, CA 92626 (US).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): BERRY, Dickey, J. [US/US]; 5787 Via Barcelona, La Verne, CA 91750 (US). ACKLAND, Mark, A. [US/US]; 1920 Canyon Close Road, Pasadena, CA 91107 (US). CHANG, Angela [US/US]; 2310 Tulsa Avenue, Claremont, CA 91711 (US). KELLY, James, T. [US/US]; 895 Carmen Street, La Verne, CA 91750 (US).</p> <p>(74) Agent: STEPHENS, L., Keith; Rockwell International Corporation, Suite 700, 600 Anton Boulevard, P.O. Box 5090, Costa Mesa, CA 92628-5090 (US).</p>	<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>
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<p>(54) Title: APPARATUS FOR PROVIDING AIRCRAFT ENTERTAINMENT</p> <p>(57) Abstract</p> <p>The in-flight entertainment (IFE) system, according to the present invention, receives the audible components of the live performance at a microphone (24), and receives the visual components of the performance at a camera (28). The microphone (24) generates audio signals that are routed through a signal distribution system (16) of the IFE to headphones located at and connected to the passenger seat terminals (18). The camera generates video signals that are also routed through signal distribution system (16) of the IFE to video displays located at and connected to the passenger seat terminals. Any passenger may optionally use the terminal to listen to the performance via headphones, and/or view the performance via a display on the passenger terminal.</p>				
<pre> graph LR subgraph 20 22[22] 24[24] end 28[28] 26[AUDIO CONDITIONER 26] 30[VIDEO RECEIVER 30] 34[A/D ENCODER 34] 36[MODULATOR 36] 38[Tx 38] 16_18[TO NETWORK 16 AND/OR TERMINALS 18] 24 --> 26 28 --> 30 26 --> 34 30 --> 34 34 --> 36 36 --> 38 38 --> 16_18 </pre>				

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APPARATUS FOR PROVIDING AIRCRAFT ENTERTAINMENT

5

BACKGROUND OF THE INVENTION

(a) Field of the Invention

The present invention relates generally to aircraft entertainments systems. More particularly, it relates to a method and apparatus for providing entertainment on-board an aircraft during flight.

10

(b) Description of Related Art

Aircrafts typically include some form of electronic distribution system for controlling and coordinating the distribution throughout the aircraft of electronic communications such as seat lighting commands, attendant call commands, public address announcements, and audio/video entertainment signals. In many recently developed systems, data communications such as video game software or menus of the available aircraft services may also be distributed.

15

A typical aircraft communication system includes a headend area, a signal distribution network, and a plurality of peripheral stations consisting primarily of passenger seat stations or terminals. In general, the headend is located at the front of the aircraft cabin, and provides, inter alia, a central location for the assembly of the entertainment related signals/services that are transmitted to

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passenger terminals via the aircraft communication system. If the communication signals relate to entertainment services, the aircraft communication system is often referred to as an in-flight entertainment (IFE) system.

5 A typical headend of an IFE system includes sources for video and related audio, audio unrelated to the video, and entertainment data such as game software and/or menu data. The audio source can include audio tape players (digital and analog), compact disk (CD) players, and other similar devices. The video source can include
10 conventional video tape players (digital and analog), conventional video disk players, and other similar devices. The data source can be a conventional hard or floppy disk storage medium and a conventional computer.

 A common feature of the above-described entertainment
15 sources is that they are all recorded. Although recorded entertainment sources generally provide predictability and quality-control, they lack, of course, spontaneity and audience interaction. To date, aircraft entertainment systems have limited their entertainment options to pre-recorded video, audio and/or software
20 entertainment. Accordingly, there is a need for a method and apparatus that provides spontaneity, content flexibility, audience interactions, and other features that are not ordinarily attainable from pre-recorded entertainment sources.

SUMMARY OF THE INVENTION

25 The present invention may be embodied in an in-flight entertainment system that receives and distributes live entertainment, thereby providing the spontaneity, content flexibility, audience interactions, and other features that are not ordinarily attainable from pre-recorded entertainment sources. The live entertainment may have
30 both sound and visual components. Preferably, the entertainment

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takes the form of a live performance such as a comic act, a magic act, a poetry reading, a dramatic play, and other similar performances. The performers are on-board the flight and perform their act on the aircraft. Depending on the size of the aircraft, the performers may be
5 located where all of the passengers can directly see them, or where only some of the passengers can directly see them, or where none of the passengers can directly see them.

The in-flight entertainment system, according to the present invention, receives the audible components of the live performance at
10 a microphone, and receives the visual components of the performance at a camera. The microphone generates audio signals that are routed through a signal distribution system of the IFE to headphones located at and connected to the passenger seat terminals. The camera generates video signals that are also routed through the signal
15 distribution system of the IFE to video displays located at and connected to the passenger seat terminals. Any passenger may optionally use his/her terminal to listen to the performance via headphones, and/or view the performance via a display on the passenger terminal. Depending on the nature of the
20 performance, the performers may be provided with a performance area at the front of the aircraft cabin within view of the passengers, or the performers may be provided with a performance area not within view of the passengers, or the performers may prefer to just walk along the existing isle space. Some of the passenger seats may need
25 to be removed from the existing aircraft cabin in order to provide space for the performance area. A dramatic performance involving several actors may call for such a performance area, while a stand-up comedian may prefer to walk along the existing isle space.

A large aircraft can seat between 400 and 450 passengers in
30 an elongated seating arrangement. The present invention allows the

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sound and visual components of the live performance to be made available to all of the passengers even though the passenger may be relatively far away from the performers. The present invention also allows those passengers who are not interested in the performance to
5 avoid it by not listening to their headphones and/or not displaying the performance on their terminal monitors.

Accordingly, the present invention may be embodied in a method of providing entertainment to passengers on an aircraft via an in-flight entertainment system, the steps comprising: providing
10 headend equipment at a headend area of the aircraft; providing a signal distribution network in communication with said headend equipment, said network extending from said headend area throughout a passenger area of the aircraft; providing a plurality of passenger seat terminals in communication with said network, said
15 passenger seat terminals located at passenger seats of the aircraft; providing as part of said headend equipment a public address system having a public-address (PA) microphone, whereby announcements made at said PA microphone override other audio transmissions on said network; providing as part of said headend
20 equipment pre-recorded entertainment; providing on-board said aircraft at least one performer for performing live entertainment; providing as part of said headend equipment means for receiving said live entertainment from said at least one performer located on-board said aircraft, said means for receiving live entertainment coupling said
25 live entertainment to said passenger seat terminals via said network.

In one aspect of the above-described method, said means for receiving live entertainment comprises a microphone and/or a camera; said method comprises the step of providing as part of said headend area a performance area for said at least one performer; and said

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performance area is not visible to passengers seated at said passenger seats of said aircraft.

The present invention may further be embodied in an in-flight entertainment system for use on a passenger aircraft, the system comprising: headend equipment located at a headend area of the aircraft; a signal distribution network in communication with said headend equipment, said network extending from said headend area throughout a passenger area of the aircraft; a plurality of passenger seat terminals in communication with said network, said passenger seat terminals located at passenger seats of the aircraft; said headend equipment comprising a public address system having a public-address (PA) microphone, whereby announcements made at said PA microphone override other audio transmissions on said network; said headend equipment further comprising sources of recorded entertainment; said headend equipment further comprising means for receiving live entertainment from at least one performer located on-board said aircraft, said means for receiving live entertainment coupling said live entertainment to said passenger seat terminals via said network.

In one aspect of the above-described system, said means for receiving live entertainment comprises a microphone and/or a camera.

In another aspect of the above-described system, said headend area comprises a performance area for said at least one performer; and said performance area is not visible to passengers seated at said passenger seats of said aircraft.

Accordingly, present invention, as embodied in the disclosed method and apparatus for providing in-flight live entertainment, provides spontaneity, content flexibility, audience interactions, and

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other features that are not ordinarily attainable from pre-recorded entertainment sources.

The invention itself, together with further objects and attendant advantages, will best be understood by reference to the following detailed description, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram of an aircraft electronic distribution system capable utilizing the present invention.

FIG. 2 is a diagram of a portion of the headend area of the system shown in FIG. 1. The headend incorporates a means for generating and distributing live entertainment embodying the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

By way of introduction, a general description of the invention and the disclosed embodiments thereof will now be provided. The present invention may be embodied in an in-flight entertainment system that receives and distributes live entertainment, thereby providing the spontaneity, content flexibility, audience interactions, and other features that are not ordinarily attainable from pre-recorded entertainment sources. The live entertainment may have both sound and visual components. Preferably, the entertainment takes the form of a live performance such as a comic act, a magic act, a poetry reading, a dramatic play, and other similar performances. The performers are on-board the flight and perform their act on the aircraft. Depending on the size of the aircraft, the performers may be located where all of the passengers can directly see them, or where only some of the passengers can directly see them, or where none of the passengers can directly see them.

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The in-flight entertainment system, according to the present invention, receives the audible components of the live performance at a microphone, and receives the visual components of the performance at a camera. The microphone generates audio signals that are routed
5 through a signal distribution system of the IFE to headphones located at and connected to the passenger seat terminals. The camera generates video signals that are also routed through the signal distribution system of the IFE to video displays located at and connected to the passenger seat terminals. Any passenger may
10 optionally use his/her terminal to listen to the performance via headphones, and/or view the performance via a display on the passenger terminal. Depending on the nature of the performance, the performers may be provided with a performance area at the front of the aircraft cabin within view of the passengers, or the performers
15 may be provided with a performance area not within view of the passengers, or the performers may prefer to just walk along the existing isle space. Some of the passenger seats may need to be removed from the existing aircraft cabin in order to provide space for the performance area. A dramatic performance involving several
20 actors may call for such a performance area, while a stand-up comedian may prefer to walk along the existing isle space.

A large aircraft can seat between 400 and 450 passengers in an elongated seating arrangement. The present invention allows the sound and visual components of the live performance to be made
25 available to all of the passengers even though the passenger may be relatively far away from the performers. The present invention also allows those passengers who are not interested in the performance to avoid it by not listening to their headphones and/or not displaying the performance on their terminal monitors.

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Turning now to the figures, and to a more detailed description of the disclosed embodiment of the present invention, FIG. 1 illustrates an aircraft electronic distribution system capable utilizing the present invention, and FIG. 2 is a diagram of a portion of the headend area of the system shown in FIG. 1, wherein the headend incorporates a means for generating and distributing live entertainment embodying the present invention.

As shown in FIG. 1, an aircraft 10 incorporates an aircraft electronic signal distribution system 12. Aircrafts typically include some form of electronic distribution system for controlling and coordinating the distribution throughout the aircraft of electronic communications such as seat lighting commands, attendant call commands, audio announcements, and audio/video entertainment signals. In many recently developed systems, data communications such as video game software or menus of the available aircraft services may also be distributed.

The aircraft communication system 12 includes a headend area 14, a signal distribution network 16, and a plurality of peripherals 18 consisting primarily of passenger seat stations or terminals. In general, the headend 14 is located at the front of the aircraft cabin, and provides, inter alia, a central location for the assembly of the entertainment related signals/services that are transmitted to the passenger terminals 18 via the aircraft communication system 12. If the communication signals relate to entertainment services, the aircraft communication system 12 is often referred to as an in-flight entertainment (IFE) system 12.

A typical headend 14 of an IFE system 12 includes sources for video and related audio, audio unrelated to the video, and entertainment data such as game software and/or menu data. These entertainment options are all pre-recorded on an appropriate medium

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such as tape or disk. The audio source can include audio tape players (digital and analog), compact disk (CD) players, and other similar devices. The video source can include conventional video tape players (digital and analog), conventional video disk players, and other
5 similar devices. The data source can be a conventional hard or floppy disk storage medium and a conventional computer.

According to the present invention, the headend 14 shown in FIG. 1 incorporates a performance area 20 for locating a performer 22 (shown in FIG. 2) who is performing live entertainment, and the IFE
10 system 12 incorporates, in addition to the traditional on-board pre-recorded audio, video and data entertainment sources, the performance area 20 and a means for generating and distributing live entertainment.

FIG. 2 is a diagram illustrating more details about the means for
15 receiving and distributing live entertainment embodying the present invention. The live entertainment receiver and distribution means includes a performance area represented generally by the dotted line shown at 20, a microphone (or receiver) 24 coupled to an RF receiver or audio conditioner 26, a video camera (or receiver) 28 coupled to a
20 RF receiver or video processor/conditioner 30, an analog-to-digital (A/D) encoder 34 coupled to the audio receiver 26 and the video receiver 30, a modulator 36 coupled to the encoder 34, and a transmitter 38 coupled to the modulator 36. The transmitter 38 is in communication with the passenger seat terminals 18 via the aircraft
25 signal distribution network 16. The encoder 34, modulator 36 and transmitter 38 are illustrated for diagrammatic purposes only as separate devices that process both video and audio signals. In practice, these elements may or may not be separate and may or may not process and transmit both audio and video signals.

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The live audio entertainment output from the microphone 24 and the live video entertainment output from the camera 28 are routed through the aircraft signal distribution network 16 to the passenger seat terminals 18 in substantially the same manner as pre-recorded audio and video entertainment. The diagrams shown in FIGS. 1 and 2 are representative of a general transmission scheme for the live audio and live video. Aircraft IFE systems are well known in the art, and a variety of IFE systems having a variety of characteristics and features (including specifically the ability to transmit and process video and audio in both digital and analog) would be suitable for use in connection with the present invention.

In general, the microphone 24 receives live sound entertainment from the performer 22, and provides audio signals to the RF receiver/conditioner 26. The microphone 24 may be hard-wire connected to the receiver/conditioner 26, or the microphone 24 may transmit RF signals to the receiver/conditioner 26, thereby allowing the performer 22 more flexibility to move around the performance area 20.

The video camera 28 receives the visual images of the live entertainment and provides video signals to the RF video receiver/conditioner 30. The camera 28, like the microphone 24, may be hard-wire connected to the receiver/conditioner 30, or the camera 28 may transmit RF signals to the receiver/conditioner 30, thereby reducing overall system complexity and the amount of wiring in the IFE 12.

The encoder 34 receives live audio signals in analog form from the microphone 24. The encoder 34 converts the analog audio to digital, and the modulator 36 modulates the digital audio, preferably using a conventional pulse code modulation (PCM) scheme. The transmitter 38 forwards the modulated audio to the passenger seat

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terminals 18. Preferably, the transmitter 38 converts the modulated audio to RF signals and transmits the RF audio signals to the passenger seat terminals 18. Alternatively, the modulated audio could be transmitted to the seat terminals 18 via a hardwired connection. The passenger seat terminal 18 includes circuitry for receiving the modulated digital audio and generating the original live performance audio. The live audio would be available on its own channel via the terminal 18 and headphones (not shown) connected thereto.

10 The encoder 34 also receives live video signals in analog form from the camera 28. The encoder 34 converts the analog video to digital, and the modulator 36 modulates the digital audio, preferably using a conventional pulse code modulation (PCM) scheme. Because of the bandwidth requirements of video, some form of conventional
15 video compression and/or forward error correction may also be utilized. The transmitter 38 forwards the modulated video to the passenger seat terminals 18. Preferably, the transmitter 38 converts the modulated video to RF signals and transmits the RF video signals to the passenger seat terminals 18. Alternatively, the modulated
20 video could be transmitted to the seat terminals 18 via a hardwired connection. The passenger seat terminal 18 includes circuitry for receiving the modulated digital video and generating the original live performance video. If the digital video was compressed and/or error corrected before being transmitted, the above-referenced circuitry
25 includes decompression and error correction circuitry. The live video would be available on its own channel via the terminal 18 and a display (not shown) incorporated as part of the terminal 18.

 Alternatively, the analog video from the camera 28 could bypass the A/D converter 34 and feed directly into the modulator 36
30 which could provide analog carrier modulation for the video. The

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analog video would then be frequency multiplexed with digital audio, and provided on its own video channel.

It should be noted that, for safety reasons, the live audio feed of the present invention, like all other audio entertainment options on-
5 board the aircraft, may be overridden by the aircraft's public-address system, which is used by flight attendants and/or the pilot to make announcements to the passengers.

Thus, based on the foregoing descriptions and illustrations, it can be seen that the present invention provides several advantages.
10 The in-flight entertainment system embodying the present invention receives and distributes live entertainment, thereby providing the spontaneity, content flexibility, audience interactions, and other features that are not ordinarily attainable from pre-recorded entertainment sources. Preferably, the entertainment takes the form
15 of a live performance such as a comic act, a magic act, a poetry reading, a dramatic play, and other similar performances. The performers are on-board the flight and perform their act on the aircraft. Depending on the size of the aircraft, the performers may be located where all of the passengers can directly see them, or where
20 only some of the passengers can directly see them, or where none of the passengers can directly see them. Any passenger may optionally use his/her terminal to listen to the performance via headphones, and/or view the performance via a display on the passenger terminal. The present invention allows the sound and visual components of the
25 live performance to be made available to all of the passengers even though the passenger may be relatively far away from the performers. The present invention also allows those passengers who are not interested in the performance to avoid it by not listening to their headphones and/or not displaying the performance on their terminal
30 monitors.

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Of course, it should be understood that a range of changes and modifications can be made to the preferred embodiment described above. For example, the present invention is described in connection with a particular hardware and processing structure for transmitting and receiving live video/audio entertainment signals in an aircraft IFE system. However, a wide variety of transmitting and receiving structures could be utilized as long as the essential distribution features described herein in connection with live entertainment on-board aircraft flight are present. The audio and video may be transmitted as digital signals or as analog signals. It is therefore intended that the foregoing detailed description be regarded as illustrative rather than limiting and that it be understood that it is the following claims, including all equivalents, which are intended to define the scope of this invention.

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FOREIGN CLAIMS AND ABSTRACT

CLAIMS

What is claimed is:

1. A method of providing entertainment to passengers on
5 an aircraft via an in-flight entertainment system, the steps comprising:
 providing headend equipment at a headend area of the aircraft;
 providing a signal distribution network in communication with
said headend equipment, said network extending from said headend
area throughout a passenger area of the aircraft;
10 providing a plurality of passenger seat terminals in
communication with said network, said passenger seat terminals
located at passenger seats of the aircraft;
 providing as part of said headend equipment a public address
system having a public-address (PA) microphone, whereby
15 announcements made at said PA microphone override other audio
transmissions on said network;
 providing as part of said headend equipment pre-recorded
entertainment;
 providing on-board said aircraft at least one performer (22) for
20 performing live entertainment;
 providing as part of said headend equipment a receiver (24 or
28) for receiving said live entertainment from said at least one
performer located on-board said aircraft, said receiver receiving live
entertainment and coupling said live entertainment to said passenger
25 seat terminals via said network.

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2. The method of claim 1 wherein said receiver comprises a microphone.

3. The method of claim 1 further comprising the step of providing as part of said headend area a performance area (20) for said at least one performer.

4. The method of claim 3 wherein said performance area is not visible to passengers seated at said passenger seats of said aircraft.

5. The method of claim 2 or 4 wherein said receiver comprises a camera.

6. An in-flight entertainment system for use on a passenger aircraft, the system comprising:

headend equipment located at a headend area of the aircraft;

a signal distribution network in communication with said headend equipment, said network extending from said headend area throughout a passenger area of the aircraft;

a plurality of passenger seat terminals in communication with said network, said passenger seat terminals located at passenger seats of the aircraft;

said headend equipment comprising a public address system having a public-address (PA) microphone, whereby announcements made at said PA microphone override other audio transmissions on said network;

said headend equipment further comprising sources of recorded entertainment;

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said headend equipment further comprising a receiver (24 or 28) for receiving live entertainment from at least one performer (22) located on-board said aircraft, said receiver for receiving live entertainment coupling said live entertainment to said passenger seat terminals via said network.

7. The system of claim 6 wherein said receiver comprises a microphone.

8. The system of claim 7 wherein said receiver further comprises a camera.

9. The system of claim 6 wherein said headend area comprises a performance area (20) for said at least one performer.

10. The system of claim 9 wherein said performance area is not visible to passengers seated at said passenger seats of said aircraft.

11. The system of claim 10 wherein said receiver comprises a camera.

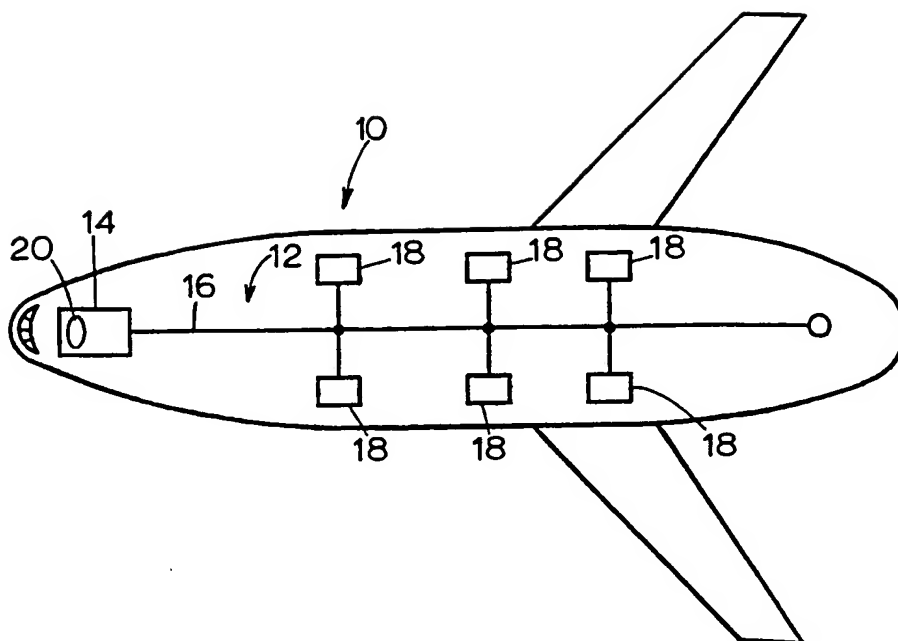


FIG. 1

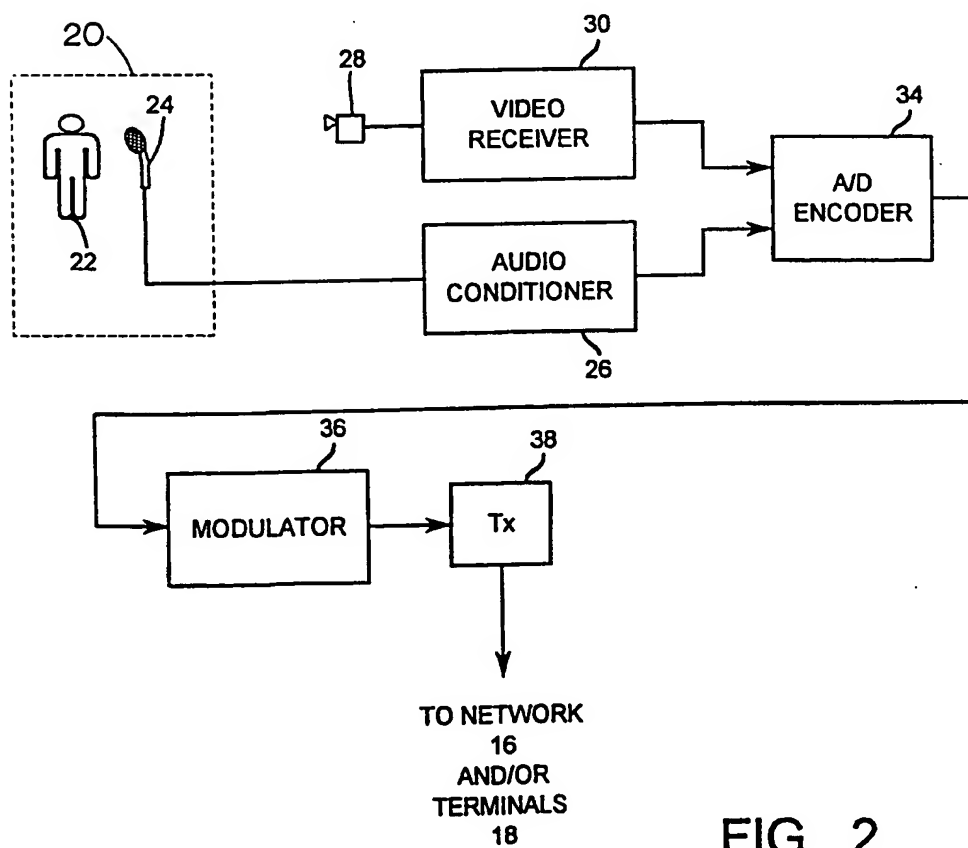
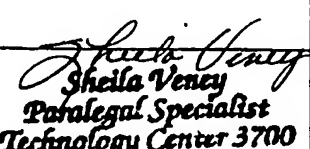


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/11257

A. CLASSIFICATION OF SUBJECT MATTER IPC(6) : H04N 7/08 US CL : 434/308 According to International Patent Classification (IPC) or to both national classification and IPC																				
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) U.S. : 434/308, 307A, 309, 29, 38, 44, 45, 55, 58, 260, 340, 432; 348/8, 144, 13; 297/188; 463/25 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched NONE Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) APS; SEARCH TERMS AIR? AND ENTERTAIN?																				
C. DOCUMENTS CONSIDERED TO BE RELEVANT																				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																		
Y	US 4,866,515 A (TAGAWA ET AL.) 12 SEPTEMBER 1989, SEE ENTIRE DOCUMENT	1-12																		
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.																				
<table border="0"><tr><td>* Special categories of cited documents:</td><td>*T</td><td>later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td></tr><tr><td>"A" document defining the general state of the art which is not considered to be of particular relevance</td><td>*X</td><td>document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td></tr><tr><td>"B" earlier document published on or after the international filing date</td><td>*Y</td><td>document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td></tr><tr><td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td><td>*Z</td><td>document member of the same patent family</td></tr><tr><td>"O" document referring to an oral disclosure, use, exhibition or other means</td><td></td><td></td></tr><tr><td>"P" document published prior to the international filing date but later than the priority date claimed</td><td></td><td></td></tr></table>			* Special categories of cited documents:	*T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"A" document defining the general state of the art which is not considered to be of particular relevance	*X	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"B" earlier document published on or after the international filing date	*Y	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z	document member of the same patent family	"O" document referring to an oral disclosure, use, exhibition or other means			"P" document published prior to the international filing date but later than the priority date claimed		
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Date of the actual completion of the international search 21 OCTOBER 1998		Date of mailing of the international search report 30.10.98																		
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230		Authorized officer TANYA CALLAWAY Telephone No. (703) 305-6897  Patalegal Specialist Technology Center 3700																		